

Entry of the proposed amendment and reconsideration of the above-identified application is respectfully requested in view of the following remarks:

REMARKS

First, applicants' representative would like to thank Examiners Arnold and Griffin for courteously granting an interview which was held November 6, 2003. During the interview, a proposed amendment very similar to the amendment presented herein was discussed wherein the specification was amended to reflect more accurately the ratios of cerium to other lanthanides present in the composition of this invention and to limit the claimed composition to a ratio of cerium oxide to oxides of a lanthanide series other than cerium oxide to one which is set forth in the examples of this application. No agreement was reached during the interview as to the entry of the proposed amendment or to allowance of the amended claims as proposed herein.

The specification has been amended to more accurately describe the ratio of ceria to lanthanide oxides other than ceria which can be present in the composition of this invention. At page 7, lines 5-9, the ratio of ceria to lanthanide oxides other than ceria present in the composition of this invention was originally set forth as 1:4 to 4:1 by weight, preferably 1:2 to 2:1. These specific numerical ratios were inconsistent when considered in light of the previous description of the amounts of ceria and lanthanide oxides other than ceria which could be incorporated into the acidic oxide support and the instant examples. The Examiner is kindly invited to page 6, lines 23-29 of the instant specification, where it is stated that the amount of ceria can be present in amounts of up to about 25 parts by weight cerium oxide per 100 parts of the acidic oxide support material. In the following passage beginning at page 6, line 30, continuing through page 7, line 4, it is stated that the lanthanide oxide other than ceria can be present in amounts

of at least about 0.05 parts by weight of oxide per 100 parts by weight of the acidic oxide support material. Accordingly, these two passages allow the relative amount of ceria to lanthanide oxides other than ceria to be as high as 500:1, determined by taking the largest amount of cerium oxide of 25 parts by weight to 100 parts by weight of the acidic oxide material, divided by the lowest amount of lanthanide oxide other than ceria which can be present equal to 0.05 parts by weight of oxide per 100 parts by weight of acidic oxide support material. The specification has further been amended at page 7 to state that the ratio of ceria to lanthanide oxides other than ceria can range from about 1.66:1 to 5:1 by weight. This range is expressly set forth in the examples in the specification in which the lowest ratio of 1.66:1 is set forth in Example 2 and wherein the ratio of 5:1 is set forth in Examples 1 and 3. Further, the specification has been amended at page 7 to indicate that the lanthanide oxides other than ceria can include "one or two" lanthanide oxide materials. This description of the invention is also provided from the instant examples, Examples 1-4, wherein only one or two lanthanide oxides other than ceria were present on the acidic oxide support. Accordingly, it is not believed that any new matter has been added to the specification. The changes simply represent a more consistent description of the amounts of the ceria and lanthanide oxides other than ceria which can be present in the composition of the present invention. All of the weight ratios which have been added have been determined from the amounts originally set forth in the instant application. All the amounts are now consistent throughout the application.

Independent claims 1 and 17 have been amended to define the relative ceria content as consistent with the instant examples. Thus, the ratio of (ii) cerium oxide to (iii) at least one oxide of a lanthanide series element other than cerium oxide is defined as from at least 1.66:1, taken specifically from the instant examples in which instant

Example 2 provides the minimum ratio of ceria to lanthanide oxides other than ceria which is now claimed. Accordingly, it is believed that the amendment to claims 1 and 17 is fully consistent and supported by the original disclosure.

It is further noted that claims 1 and 17 have been amended to again state that component (iv), an oxide of a transition metal such as from Groups Ib and IIb of the Periodic Table, is now an optional component. As it will be explained below, it is believed that none of the art cited or applied or known by applicants recite an acidic oxide support containing the amounts of ceria and lanthanide oxides other than ceria which are now claimed.

Very briefly, it has been discovered that a composition effective for the reduction of NO<sub>x</sub> gas emissions in FCC processes can be made by incorporating ceria into an acidic oxide support and incorporating small amounts of lanthanide oxides other than ceria on the support. While it is believed that the use of ceria on an acidic oxide support such as alumina has been known for NO<sub>x</sub> reduction, it is the applicants' discovery that by incorporating minor amounts of other lanthanide oxides on the support, the ceria can be stabilized and maintain efficient NO<sub>x</sub> reduction under the conditions of the FCC environment. For the sake of economy, it is useful to use as little lanthanide oxides other than ceria as possible to provide the ceria stabilization.

Claims 1-5 and 9-21 have been rejected under 35 USC 103(a) as being unpatentable over Peters et al. (U.S. 6,129,834) in view of Green et al. (U.S. 4,973,399). The Examiner applies Peters as disclosing an NO<sub>x</sub> removal composition comprising an acidic oxide support, cerium oxide, and at least one oxide of a transition metal such as from Groups Ib and IIb of the Periodic Table, including copper and silver. The primary reference discloses a composition wherein the acidic oxide support is either alumina or silica alumina and also discloses a composition where the alumina to silica mol ratio is

3:1 to 50:1. The Examiner admits that the Peters reference does not disclose a composition comprising at least one oxide of a lanthanide series element other than cerium oxide. The Examiner applies Green as disclosing a mixture of lanthanide oxides including cerium oxide and praseodymium oxide. Green discloses a composition for reducing noxious nitrogen oxide emissions. The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the composition of Peters to include a composition comprising at least one oxide of a lanthanide series element other than cerium oxide such as praseodymium oxide as disclosed by Green. The Examiner states that in as much as Green suggested a mixture of rare earths may be used, that only the suggestion of the mixture is needed for obviousness purposes. No further discussion to any advantage of using the mixture is needed. The rejection is respectfully traversed.

As stated in applicants' amendment filed on July 11, 2003, it is applicants' position that the patent to Green cannot be properly combined with the primary reference to Peters to provide an obviousness rejection and, even if such references can be properly combined, the combination provides a result which is wholly unexpected from the reading of the applied references. Applicants' remarks presented in the July 11, 2003 amendment are incorporated herein by reference.

With respect to the Examiner's conclusion that the substitution of the rare earth mixture of Green cannot be overcome by a showing of advantageous results is not well taken. The reference to Green is utilized in combination with Peters to render an obviousness rejection of the claims. Green does not suggest any advantage of using a combination of cerium oxides with other lanthanum oxides to ceria alone. The fact that applicants have shown in the Examples that the cerium oxide is stabilized by the addition of other lanthanide oxides, as shown by the % retention of NO uptake after

steaming of the catalyst, presents unexpected results in as much as Green does not suggest any advantage of a mixture of ceria with other lanthanide oxides. The showing of advantageous or unexpected results is the antithesis of obviousness. Accordingly, the combination of Peters and Green presents unobvious results. The Examiner cannot merely dismiss the advantages in an obviousness 35 USC 103 rejection. The Examiner's dismissal of the advantages found by applicants is consistent with a rejection based on anticipation. Such rejection has not been made by the Examiner. Accordingly, in a rejection based on 35 USC 103 and a combination of references, the Examiner must consider the advantages found.

As stated in the amendment of July 11, 2003, the combination of Peters and Green is not proper in as much as Peters does not disclose a zeolitic type material as a support whereas Green not only utilizes a zeolite support but specifically states that non-zeolitic supports are unacceptable (see Examples 13 and 14). The Examiner dismisses this argument by stating that the Peters reference and the instant specification do not exclude zeolitic supports. On the contrary, applicants clearly indicate in their specification what is meant by acidic oxide support at page 5, line 22, through page 6, line 6. Likewise, Peters discloses what they mean by acidic oxide support at column 2, lines 12-26. In neither the instant specification nor the applied primary reference are zeolitic type supports mentioned. Zeolites are molecular sieve materials having morphologies and properties distinct from crystalline or amorphous aluminas or silica aluminas and one of ordinary skill in the art understands these differences. Accordingly, if zeolite was meant to be included as an acidic oxide support, such zeolites would have been clearly mentioned. Accordingly, one of ordinary skill in this art would not look to Green, which uses a zeolitic support and dismisses non-zeolitic supports, to improve the additive of Peters, which does not recite zeolitic supports.

Accordingly, for the reasons expressly stated in the previous amendment filed on July 11, 2003, and above, it is believed that claims 1-5, 9, 10, 14, and 17-21 patentably distinguish over the combination of Peters and Green et al.

Further, claims 1 and 17 have been amended to state that the composition of the invention includes (ii) cerium oxide and (iii) at least one oxide of a lanthanide series element other than cerium oxide, and wherein the ratio of (ii) to (iii) ranges from at least 1.66:1 by weight. It is believed that the limitation regarding the specified ratio of cerium oxide to lanthanide oxides other than ceria is not suggested in Peters, which does not disclose a lanthanide oxide other than ceria, nor is it suggested in Green. The Examiner relies on Green, column 14, lines 49-52, as suggesting the use of a single rare earth metal or mixtures of rare earth metals. Green does not distinguish between the two and, as mentioned above, in an obviousness rejection based on 35 USC 103, this is the fatal flaw of the application of Green. More importantly, Green does not remotely disclose or suggest the ratio of cerium oxide to lanthanide oxides other than ceria which can be used unexpectedly in a NO<sub>x</sub> reduction composition. As an example, Green discloses a mixture of rare earths which includes 48% ceria oxide with the remainder a mixture of at least five other lanthanide oxides, column 14, lines 57-64. Obviously, this mixture recited in Green does not meet the limitation of the present claims which recites that the amount of ceria to the amount of lanthanide oxides other than ceria is at a ratio of at least 1.66:1. A rare earth mixture which contains only 48% ceria oxide does not meet the claimed invention. What Green did not understand is that ceria alone, while useful as a NO<sub>x</sub> reduction catalyst, can be stabilized with only minor amounts of a lanthanide oxide other than ceria. Green does not suggest such a concept in the passage at column 14 mentioned by the Examiner. Accordingly, it is believed that the amended claims 1 and 17 and the claims dependent thereon recited in the rejection patentably distinguish

over both Peters and Green and combinations thereof in as much as neither of the references suggest the relative amount of ceria to lanthanide oxides other than ceria, which is now claimed.

Claims 6-8 have been rejected under 35 USC 103(a) as being unpatentable over Peters et al. in view of Green et al. as previously applied, further in view of Lussier (U.S. 4,847,225). The Lussier reference is applied as disclosing a composition where the silica alumina is prepared by the caustic leaching of silica from calcined kaolin. The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the composition of Peters and Green to utilize a composition where the silica-alumina is prepared by caustic leaching of silica from calcined kaolin. The rejection is respectfully traversed.

First, since Green requires a zeolitic support which contains a majority of silica relative to alumina, it certainly would not be obvious to leach the silica from the kaolin to achieve the support as suggested in Green. Regardless, the reference to Lussier does not make up for the deficiencies of the applied references as described with respect to the rejection above. Accordingly, this rejection is improper for the same reasons as expressed above.

Applicants would like to bring to the attention of the Examiner U.S. 4,839,026, to Brown et al., which was mentioned in the last amendment. This patent discloses a sulfur oxide removal composition which contains an acidic oxide support, such as alumina, and a mixture of rare earth oxides. The patent does not disclose the addition of a transition metal from Group Ib or IIb. This latter limitation is now optional in the independent claims. Still, the patent to Brown et al. does not anticipate or render obvious the claimed composition in as much as the mixture of rare earths which are described in the patent do not meet the limitations of claims 1 and 17 as now amended.

The rare earth oxide mixtures of the Brown do not include the ratio of ceria to the lanthanide oxides other than ceria as now claimed. The Examiner is kindly invited to column 12, lines 36-42, column 15, lines 53-56, and column 18, lines 6-11 of the Brown et al. patent wherein is described mixtures of the rare earth oxides. In none of these passages is the claimed mixture of (ii) and (iii) described or suggested.

In view of the above remarks, it is believed that claims 1-10, 14, and 17-21 patentably distinguish over the art of record. In as much as the claims as amended clearly distinguish over the art of record, it is respectfully requested that the Examiner enter the amendment and allow the claims so amended.

Applicants reserve the right to file a divisional application on any non-elected invention.

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Date

Respectfully submitted,



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